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Pre-apprenticeships and their impact on apprenticeship completion and satisfaction

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About the research

Pre-apprenticeships and their impact on apprenticeship completion and satisfaction

Tom Karmel and Damian Oliver, NCVER

Pre-apprenticeship programs have generated interest recently from government, employers and other stakeholders in the training system as one means of improving apprenticeship completion rates and thereby ameliorating skill shortages. However, there has not yet been any research which establishes that pre-apprenticeship programs actually increase apprentice satisfaction and completion rates. This report uses data from the 2010 National Centre for Vocational Education Research (NCVER) Apprentice and Trainee Destination Survey and finds that there is no universal benefit attached to undertaking a pre-apprenticeship. Instead, the impact of pre-apprenticeships varies with occupation and prior education level.

Key messages

- Pre-apprenticeships lead to only a modest increase in satisfaction with job-related aspects of apprenticeships (but not off-the-job training aspects).
- Pre-apprenticeships increase the likelihood of completion for apprentices in the construction, food and electro-technology trades and those with a Year 10 or Year 12 level of education.
- Pre-apprenticeships reduce the likelihood of completing an apprenticeship for hairdressers and apprentices in the automotive and engineering trades and for those people who already have a certificate III or higher qualification. This suggests that the design of pre-apprenticeships is important.
- In general, apprentices who have undertaken a pre-apprenticeship are less likely to discontinue their training because they did not like the type of work or training, but this does not translate into a higher likelihood of completion.

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Contents

Tables and figures

Tables

Figures

Introduction

Pre-apprenticeship programs have generated interest recently from government, employers and other stakeholders in the training system as one means of improving apprenticeship completion rates. Dumbrell and Smith (2007), for example, found strong support for pre-apprenticeships among employers and prospective apprentices. Employers they spoke to saw the programs as an effective and efficient screening device. Dumbrell and Smith also found that those who undertake pre-apprenticeship programs are more engaged with the occupation. However, there has not yet been any research which establishes that pre-apprenticeships actually increase apprentice satisfaction and completion rates.

A pre-apprenticeship program is:

> a training pathway that prepares an individual for entry into an Australian apprenticeship. It consists of off-the-job training with a Registered Training Organisation and may contain an element of work experience with an employer. (Australian Government 2009)

In practice, there is no formal definition that distinguishes a pre-apprenticeship program from other training activity in the vocational education and training (VET) system. The apprentice and trainee data collection has little information on prior education and training, and therefore it is not possible to link pre-apprenticeships to success in apprenticeships and traineeships. Consequently, it has been difficult to measure the extent of pre-apprenticeship programs and their effectiveness in improving apprenticeship completion rates and satisfaction with training.

In response to this gap, NCVER's 2010 Apprenticeship and Traineeship Destination Survey included questions on pre-apprenticeship programs. The survey also collected information about the destinations of apprentices and trainees approximately nine months after they left their training. Information was collected on employment outcomes, reasons for non-completion, satisfaction with the apprenticeship or traineeship, and further study destinations. Further detail on the survey can be found in appendix A.

In this report, we concentrate on apprentices in trade occupations, where pre-apprenticeship programs are most prevalent. Approximately 28 per cent of apprentices and trainees in the trade occupations reported that they had completed a pre-apprenticeship program. This allows us to examine a number of questions about the impact of pre-apprenticeship training on the apprenticeship experience. First, we look at whether those who undertook pre-apprenticeship training were more satisfied with their apprenticeship than their peers who had not. Second, we look at whether those who undertook a pre-apprenticeship are more likely to complete their training. Third, we examine whether those who undertook a pre-apprenticeship but who did not complete their apprenticeship are less likely to give work- or training-based factors as their reason for not completing their training. Our motivation is to determine whether the pre-apprenticeship training gives potential apprentices a more realistic idea of what an apprenticeship really is.

In answering these questions we try to tease out a number of relationships to assist our understanding of the potential role of pre-apprenticeship training:

- What is the relationship between pre-apprenticeship training and prior education? In particular, we are interested in whether pre-apprenticeship training is a complement to prior education or whether it is remediating low levels of prior education.

- ✧ If pre-apprenticeship training provides apprentices with a better appreciation of what the trade is about, does this have an impact on completion rates?

We find only a small effect of pre-apprenticeships on satisfaction with the employment aspects of the apprenticeship. There was no impact on satisfaction with off-the-job training. Pre-apprenticeships have more of an effect on the likelihood of completion and the reasons for non-completion, but the interaction effects matter. That is, the effect of pre-apprenticeship varies, depending on the occupation of the apprenticeship and the apprentices' highest level of education. Apprentices in the construction and food trades and apprentices whose highest previous level of education is Year 10 or Year 12 are more likely to complete their training if they have undertaken a pre-apprenticeship. For other occupations and levels of education, notably hairdressing and those with certificate III or higher qualifications, completing a pre-apprenticeship appears to reduce the likelihood of completing an apprenticeship. Among apprentices who do not complete their training, pre-apprenticeships reduce the likelihood of discontinuing because of the type of work or training involved. However, this does not seem to translate into a greater likelihood of completion.

Background

There is no precise definition of what comprises a pre-apprenticeship. This has led to an array of different approaches and nomenclature, with terms such as pre-vocational and pre-employment also in use. What is clear is that pre-apprenticeships have been around since early in the twentieth century, being valued by both employers and potential apprentices as an introduction to work in a trade. However, the introduction of traineeships in the 1980s seems to have displaced the popularity of pre-apprenticeships and their use declined over the 1990s (Dumbrell 2004).

Because there is no formal definition of what constitutes a pre-apprenticeship, it is not a straightforward process to identify them. A pre-apprenticeship program could take the form of an Australian Qualifications Framework (AQF) qualification, a course accredited by a state training authority, or a combination of accredited and unaccredited training. Many VET in Schools courses could also be considered pre-apprenticeship programs. The Victorian Government (2010) has aligned pre-apprenticeship programs directly to existing AQF qualifications and has specified the duration credit that should be advanced to apprentices who have successfully completed pre-apprenticeship programs. The Queensland Government (2009) has accredited its own pre-trade courses, which draw competencies from national training packages together with life skills, vocational placements and/or workplace simulations. Participants may exit with an AQF qualification, or a state-accredited qualification with a statement of attainment for competencies, depending on the arrangements in place for the particular pathway. These arrangements are agreed between the government, industry and unions.

Dumbrell and Smith (2007) attempted one of the more recent estimates of the extent of pre-apprenticeships, using data from the NCVER students and courses collection. They estimate that there were 10 000 students enrolled in pre-apprenticeship programs in 2000, which declined to 5500 in 2004. Students were predominantly male and disproportionately young (aged 15–19 years). Indigenous students and students from regional areas were over-represented by comparison with the general VET student population. Students enrolled in pre-apprenticeships were more likely than other VET students to have Year 10 or below as their highest level of school.

In December 2009, the Council of Australian Governments (COAG) resolved to develop and introduce a rejuvenated pre-apprenticeship system to engage pending school leavers and early school leavers. The Ministerial Council for Tertiary Education and Employment (MCTEE) Apprentices Action Group has agreed to develop national principles for pre-apprenticeship training. In late 2009 the federal government made $20 million available to the states to provide 4000 pre-apprenticeship places. This represents a very substantial expansion in the number of publicly funded pre-apprenticeship program places. It is therefore timely to consider some of the effects of pre-apprenticeship programs on satisfaction with apprenticeship training and reasons for non-completion.

Participation in pre-apprenticeship programs

For the first time, the 2010 Apprenticeship Destination Survey included questions about pre-apprenticeship programs. Respondents were asked:

> Did you complete a pre-vocational or pre-apprenticeship course before you started your [apprenticeship or traineeship] in [insert certificate]?

As a prompt, interviewers were advised that 'Pre-vocational (which means before work) and pre-apprenticeship courses help you develop skills to get a job, or prepare you to become an apprentice or trainee. This includes VET in Schools courses'.

Thus our definition of pre-apprenticeships is based on self-identification rather than the official title of a course. One in four (27.6%) respondents said they had completed a pre-apprenticeship program. The highest pre-apprenticeship participation rates are among automotive and engineering apprenticeships (32.5%). Pre-apprenticeships were least common in the 'All other technical and trades workers' category, which includes ICT and science technicians (ANZSCO classification 31), skilled animal and horticultural workers (ANZSCO classification 36) and other trades workers and technicians (ANZSCO classification 39), except for hairdressers (ANZSCO classification 391).

The only information collected in the survey about the pre-apprenticeship was whether it was relevant to the apprenticeship that had been undertaken by the respondent. In response to the question 'how relevant was this course to your apprenticeship/traineeship?', respondents could nominate highly relevant, some relevance, very little relevance or not at all relevant. We have grouped 'highly relevant' and 'some relevance' as 'relevant' and 'very little relevance' and 'not at all relevant' as 'not relevant'. In eight out of ten cases, the pre-apprenticeship was relevant and this was generally the case for each occupational category. The breakdown by highest level of education differs from previous research, in that those with a Year 10 education or lower were not more likely to have undertaken a pre-apprenticeship.

Further descriptive statistics are presented in appendix B, included selected outcomes.

Table 1 Participation in a pre-apprenticeship program by occupation

		Participated in a pre-apprenticeship		Did not participate in a pre-apprenticeship
ANZSCO occupation	Total	Relevant to apprenticeship	Not relevant to apprenticeship	
32 Automotive and engineering trades workers	32.5	27.5	5.0	67.5
33 Construction trades workers	27.6	22.5	5.1	72.4
34 Electrical trades workers	24.1	18.9	5.3	75.9
35 Food trades workers	27.4	22.5	4.9	72.6
391 Hairdressers	29.3	23.8	5.5	70.7
All other technical and trades workers	22.0	18.2	3.9	78.0
3 Technical and trades workers	**27.6**	**22.7**	**4.9**	**72.4**
Cert. III or higher	26.4	17.9	8.5	73.6
Year 12	26.3	22.6	3.7	73.7
Year 11	34.2	27.0	7.2	65.8
Year 10 or below	26.3	22.2	4.1	73.7

Source: 2010 Apprentice Destination Survey.

Satisfaction

We would expect that pre-apprenticeship programs would increase satisfaction with apprenticeships and traineeships. Pre-apprenticeships are intended to provide students with a realistic preview of the range of tasks as well as the working and learning environment for an apprentice. Research on graduate employment suggests that unmet expectations contribute to lower satisfaction and higher levels of turnover (Mabey, Clark & Daniels 1996). The Apprenticeship Destination Survey asks respondents 17 separate questions related to satisfaction with particular aspects of their apprenticeship: one relating to the apprenticeship or traineeship overall, six items relating to off-the-job training and nine items relating to their employment. Apprentices employed by group training schemes were asked an additional question. Respondents were asked to rate their satisfaction from very satisfied to very dissatisfied.

A factor analysis was conducted to identify what underlying constructs shape apprentice satisfaction. Two factors were found. The first factor relates to job-based aspects such as employment conditions and workplace climate. The nine employment-related items loaded positively onto this factor. The second factor relates more specifically to off-the-job training, with the job-related aspects loading negatively. For simplicity, we have called the first factor 'satisfaction with job-related aspects' and the second factor 'satisfaction with off-the-job training-related aspects'. The items are shown below in table 2. A full explanation of the results and procedure is given in appendix C.

Table 2 Standardised scoring coefficients for satisfaction with job-related and training-related aspects of apprenticeship

Apprentice satisfaction with …	Job-related aspects	Off-the-job training-related aspects
The type of work you were/are doing	0.115	-0.016
The working conditions	0.156	-0.039
The pay	0.052	-0.007
The hours of work	0.067	0.003
Receiving adequate supervision	0.139	-0.024
Relationships with co-workers	0.080	-0.019
Training provided by your employer	0.178	-0.046
The skills you learnt on the job	0.119	-0.014
Your employment overall	0.307	-0.079
Frequency of training	-0.023	0.151
Relevance of the skills to your workplace	-0.025	0.170
The fairness of the assessments of your skills and knowledge	-0.034	0.193
The relevance of the assessment tasks	-0.049	0.238
The quality of the training facilities and equipment	-0.041	0.168
Overall quality of the off-the-job training	-0.071	0.321
Overall satisfaction with apprenticeship/traineeships	0.073	0.027

We now move to identifying whether pre-apprenticeship programs have any impact on these two satisfaction factors. To test this, we run simple multiple regression models with the satisfaction scores as the dependent variable. As an independent variable, we enter whether the respondent had completed a pre-apprenticeship program. We include as control variables: age, occupation, duration, whether the apprenticeship was undertaken on a full-time or part-time basis, and prior level of education.[1]

The intention of pre-apprenticeships is to equip apprentices with the necessary skills to undertake the apprenticeship. As such, we expect that the skills already possessed by the potential apprentice are likely to affect the usefulness of a pre-apprenticeship. On the assumption that higher levels of general education would provide a high skills base, we would expect that pre-apprenticeships are most beneficial for apprentices with lower levels of education. Therefore, we include an interaction term with previous level of education.

Pre-apprenticeships are also promoted as an introduction to the type of work involved. Therefore, we also include in the model whether there is an interaction between pre-apprenticeships and the occupation of the apprenticeship.

We also considered interactions between pre-apprenticeships and age and sex. In theory, pre-apprenticeships might be less beneficial for older apprentices, irrespective of level of education, because of their experience in the workforce. However, we found that when we tried to include this effect in the model, it created problems with collinearity, as age and level of education are highly correlated. Similarly, there may theoretically be an added benefit for females undertaking pre-apprenticeships if they are moving into traditionally male occupations. However, in the data, sex is highly correlated with occupation, and there are very few females in the sample who undertook apprenticeships in traditional male occupations.

We test the significance of the interaction effects by running restricted models with the interaction effects removed and comparing the fit of the restricted models with that of the unrestricted model using F-tests. This procedure is outlined in appendix C4. The result is that none of the interaction effects are significant. Therefore, the restricted model is shown in table 3.

There is a small, positive non-significant effect of pre-apprenticeship programs on satisfaction with job-related aspects of the apprenticeship. The factor scores are standardised, meaning that the average score is zero and around 95% of all responses are between -2 and 2. Completing a pre-apprenticeship increases the satisfaction score by less than 1/25th of one standard deviation. To compare, the effect of undertaking the apprenticeship part-time was to increase the satisfaction by more than 1/5th of one standard deviation. In contrast, if there is any effect of a pre-apprenticeship program on satisfaction with off-the-job training, it is negative. The effect however is of no consequence. All other things being equal, undertaking a pre-apprenticeship reduces satisfaction with off-the-job training by less than 1/70th of one standard deviation.

[1] To begin with, we also included sector of employment (private/public/group training organisation). However, these variables were not significant and they were removed from the model to reduce standard errors.

Table 3 Regression coefficients—satisfaction with job-related aspects of apprenticeship/traineeship

Variable	Parameter estimate	Standard error	t Value	Pr > |t|
Intercept	0.451	0.316	1.430	0.154
Pre-apprenticeship	0.036	0.049	0.740	0.461
Income during training /100	0.071	0.008	8.740	<.0001
Female	0.006	0.100	0.060	0.950
Age at commencement	-0.048	0.020	-2.380	0.018
Age at commencement^2	0.001	0.000	2.020	0.044
A/T was part-time	0.230	0.117	1.970	0.049
Existing vs new worker	-0.073	0.082	-0.880	0.376
Highest education level				
Year 10	NA	NA	NA	NA
Year 11	-0.055	0.066	-0.830	0.407
Year 12	0.078	0.055	1.420	0.156
Cert. III or higher	0.033	0.086	0.380	0.705
Occupation				
Automotive and engineering trades	-0.101	0.076	-1.330	0.183
Construction trades	0.086	0.075	1.160	0.247
Electrical trades	-0.051	0.086	-0.600	0.551
Food trades	-0.138	0.095	-1.440	0.149
Hairdressing	-0.189	0.138	-1.370	0.171
All other trades and technical occupations	NA	NA	NA	NA

Note: NA denotes reference category.
Source: 2010 NCVER Apprenticeship and Traineeship Destination Survey.

Model statistics

N	1610
F score	7.660
R_2	0.067
Adj R	0.059

Table 4 Regression coefficients—satisfaction with off-the-job training-related aspects of apprenticeship

Variable	Parameter estimate	Standard error	T Value	Pr > |t|
Intercept	0.400	0.320	1.250	0.212
Pre-apprenticeship	-0.014	0.049	-0.280	0.777
Income during training/100	-0.011	0.008	-1.330	0.184
Female	0.119	0.102	1.170	0.242
Age at commencement	-0.031	0.020	-1.540	0.123
Age at commencement^2	0.001	0.000	2.230	0.026
A/T was part-time	0.024	0.118	0.210	0.838
Existing vs new worker	-0.005	0.084	-0.060	0.956
Highest education level				
Year 10	NA	NA	NA	NA
Year 11	-0.097	0.067	-1.440	0.150
Year 12	-0.043	0.055	-0.770	0.441
Cert. III or higher	0.130	0.087	1.500	0.135
Occupation				
Automotive and engineering trades	0.125	0.077	1.630	0.104
Construction trades	0.006	0.076	0.080	0.938
Electrical trades	-0.242	0.087	-2.780	0.006
Food trades	-0.078	0.097	-0.810	0.417
Hairdressing	0.159	0.140	1.140	0.256
All other trades and technical occupations	NA	NA	NA	NA

Note: NA denotes reference category.

Model statistics

N	1610
F score	4.600
R_2	0.042
Adj R_2	0.033

Completion

In its annual reports on apprenticeships and traineeships, NCVER calculates completion rates using administrative data reported by the state and territory training authorities to NCVER on a quarterly basis (see Harvey 2010). The starting point is to track each contract from its commencement and check whether it has resulted in a completion or not. However, for calculating a valid completion rate using this approach, sufficient time must elapse from the commencement period for the apprentices to have completed their training requirements. To produce more completion rates for more recent commencement cohorts, estimates of the number of completions are used that take into account the time lag in reporting contract outcomes to NCVER.

In this report, we use a different approach, combining data from the administrative collection with data from the Apprenticeship and Traineeship Destination Survey. Our starting point is a cohort of apprentices and trainees who ended their training (whether by completing the requirements of their contract or cancelling or withdrawing) between 1 April and 30 June 2009. For the survey, non-completers were over-sampled to reflect their lower response rates and to ensure sufficient numbers for robust analysis of this sub-group. The sample is then weighted using strata to reflect completion status as well as state and occupation.[2]

We test the impact of pre-apprenticeships in a binary logistic regression model. Our dependent variable is the completion status of the apprentice (completed training or did not complete training) and our independent variable is whether the apprentice undertook a pre-apprenticeship program.[3] As controls we add age, sex, highest level of education, occupation of apprenticeship, part-time status and existing worker status. We also include the interaction of highest level of education and occupation. It has already been shown that the incidence of pre-apprenticeships varies by occupation and highest level of education and we want to be sure that we do not attribute any effect to pre-apprenticeships that is actually the result of underlying relationships between these two variables. Finally we include interactions of whether the apprentice had undertaken a pre-apprenticeship with (1) highest level of education and (2) occupation. This enables us to test whether pre-apprenticeships improve completion rates in some circumstances but not in others.

To test if the interaction effects do have an impact on the likelihood of completion, we ran three reduced models, removing one interaction effect each time. Deviance scores based on likelihood ratios are used to compare the fit achieved by the restricted models with the full model, taking into account the additional parameter included in the full model. The procedure is outlined in appendix D. The result is that all three interaction effects significantly improve the model's fit. Therefore, we present in table 5 the full unrestricted model.

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[2] One obvious feature is that we rely on a sample of the population of apprentices and trainees, and not the entire population. Our focus here is on the impact of pre-apprenticeships on completion and not the overall completion rate. Readers should continue to rely on the annual and quarterly reports for estimates of the completion rate for each occupation.

[3] In the analysis presented here, we have not distinguished between apprentices who do not complete because they were made redundant and those who choose not to complete their training of their own volition. The survey period—April to June 2010—coincided with the economic downturn and a much higher number of apprentices were made redundant than in the 2008 destination survey (see NCVER 2010a). As a precaution, we re-ran the models presented here, excluding those apprentices who did not complete because they were made redundant. The results were substantially the same. The main pre-apprenticeship effect and the interaction effects were all in the same direction and of a similar magnitude. What this suggests is that undertaking a pre-apprenticeship is unrelated to the likelihood of being made redundant.

Table 5 Effect of undertaking pre-apprenticeship and other variables on likelihood of completing apprenticeship

Parameter	Estimate	Standard Error	Pr > ChiSq
Undertook a pre-apprenticeship	0.041	0.129	0.753
Pre-apprenticeship*			
Cert. III or higher	-0.215	0.264	0.416
Year 12	0.187	0.170	0.273
Year 11	-0.100	0.203	0.620
Automotive and engineering trades workers	-0.117	0.197	0.552
Construction trades workers	0.227	0.196	0.247
Electrical trades workers	0.003	0.269	0.990
Food trades workers	0.090	0.277	0.746
Hairdressers	-0.279	0.352	0.428
Intercept	-0.357	0.663	0.591
Female	0.028	0.102	0.785
Age at commencement	0.095	0.039	0.016
Age at commencement ^2	-0.001	0.001	0.037
Part-time worker	-0.978	0.219	<.0001
Existing worker	-0.261	0.181	0.148
Highest level of education			
Cert. III or higher	0.129	0.158	0.413
Year 12	0.282	0.101	0.005
Year 11	-0.257	0.133	0.054
Year 10	NA	NA	NA
Occupation			
Automotive and engineering trades workers	0.049	0.132	0.710
Construction trades workers	0.466	0.131	0.000
Electrical trades workers	0.302	0.158	0.056
Food trades workers	-0.798	0.179	<.0001
Hairdressers	-0.091	0.265	0.732
All other trades and technical occupations	NA	NA	NA
Cert. III or higher*			
Automotive and engineering trades workers	-0.115	0.241	0.634
Construction trades workers	0.384	0.253	0.129
Electrical trades workers	0.261	0.258	0.313
Food trades workers	-0.110	0.309	0.723
Hairdressers	-0.245	0.433	0.571
Year 12*			
Automotive and engineering trades workers	0.182	0.153	0.233
Construction trades workers	0.051	0.150	0.732
Electrical trades workers	-0.225	0.181	0.213
Food trades workers	0.092	0.221	0.678
Hairdressers	-0.120	0.283	0.671
Year 11*			
Automotive and engineering trades workers	-0.138	0.190	0.468
Construction trades workers	0.080	0.177	0.654
Electrical trades workers	0.313	0.258	0.224
Food trades workers	-0.322	0.312	0.303
Hairdressers	0.166	0.329	0.613

Note: NA denotes reference category.
Source: 2010 Apprentice and Trainees Destination Survey.

Model fit statistics

Criterion	Intercept only	Intercept and covariates
AIC	18660.89	17665.03
SC	18666.62	17882.44
-2 Log L	18658.89	17589.03
N		2256

This variation indicates that some pre-apprenticeships are better than others. From the results we have some evidence that the impact of pre-apprenticeships is far from uniform. We find that pre-apprenticeships improve completion rates considerably for the construction trades (coefficient of 0.268), and food trades (0.131) and for those with Year 12 (0.228). Elsewhere, apparently pre-apprenticeships make completion less likely, particularly for hairdressers (-0.238) and the automotive and engineering trades (-0.076) and those with a certificate III or higher qualification (-0.174).[4]

Additional information available to us in the survey by which we might differentiate pre-apprenticeships is one question asking how relevant the pre-apprenticeship was to the respondent's apprenticeship.[5] It may be the case that it is only 'relevant' pre-apprenticeship courses that improve completion. However, there is an issue with the use of this variable. We might expect that completers are more likely to judge that their pre-apprenticeship course was relevant and non-completers are more likely to judge that their pre-apprenticeship course was not relevant. Hence the variable may be endogenous and therefore not appropriate for inclusion in our model.

Nevertheless, with a view to throwing some light on the earlier result, we conducted another analysis, this time including a categorical variable, distinguishing those who had undertaken a relevant pre-apprenticeship, those who had undertaken a pre-apprenticeship that was not relevant, and those who had not undertaken any pre-apprenticeship. Once again, we test for interactions between pre-apprenticeship programs, highest level of education and occupation. Based on log likelihood ratio statistics shown in table D2, all three interaction effects were significant. Therefore, the results presented in table 6 relate to the full unrestricted model.

4 These values are the sum of the interaction and the main effect.

5 The precise wording of the question was 'How relevant was this course to your apprenticeship/traineeship?'. Respondents could answer on a four-point scale: highly relevant, some relevance, very little relevance, not at all relevant. The first two categories have been grouped as 'relevant' and the final two categories grouped as 'non-relevant'.

Table 6 Effect of undertaking relevant pre-apprenticeship and other variables and interactions on likelihood of completing apprenticeship

Parameter	Estimate	Standard error	Pr > ChiSq
Undertook a pre-apprenticeship that was relevant to A/T	0.134	0.147	0.360
Relevant pre-apprenticeship*			
Cert. III or higher	-0.092	0.317	0.770
Year 11	-0.190	0.226	0.399
Year 12	0.180	0.191	0.346
Automotive and engineering trades workers	-0.072	0.215	0.738
Construction trades workers	0.131	0.215	0.543
Electrical trades workers	0.330	0.315	0.296
Food trades workers	-0.068	0.305	0.825
Hairdressers	-0.492	0.388	0.205
Undertook a pre-apprenticeship that was not relevant to A/T	-0.184	0.235	0.432
Non-relevant pre-apprenticeships*			
Cert. III or higher	-0.302	0.429	0.482
Year 11	0.179	0.370	0.628
Year 12	-0.069	0.348	0.842
Automotive and engineering trades workers	-0.487	0.394	0.217
Construction trades workers	0.584	0.384	0.129
Electrical trades workers	-0.843	0.494	0.088
Food trades workers	0.565	0.537	0.292
Hairdressers	0.600	0.703	0.393
Intercept	-0.344	0.667	0.607
Female	0.031	0.104	0.769
Age at commencements	0.097	0.040	0.014
Age at commencement ^2	-0.001	0.001	0.036
Part-time worker	-0.988	0.219	<.0001
Existing worker	-0.283	0.182	0.121
HIghest level of education			
Cert. III or higher	0.123	0.159	0.440
Year 12	0.280	0.101	0.006
Year 11	-0.257	0.134	0.055
Year 10	NA	NA	NA
Occupation			
Automotive and engineering trades workers	0.052	0.133	0.700
Construction trades workers	0.463	0.131	0.000
Electrical trades workers	0.310	0.159	0.051
Food trades workers	-0.809	0.181	<.0001
Hairdressers	-0.094	0.267	0.724
All other trades and technical occupations	NA	NA	NA
Cert. III*			
Automotive and engineering trades workers	-0.110	0.245	0.654
Construction trades workers	0.373	0.255	0.144
Electrical trades workers	0.247	0.261	0.345
Food trades workers	-0.133	0.313	0.672
Hairdressers	-0.248	0.436	0.569
Year 12*			
Automotive and engineering trades workers	0.186	0.154	0.229
Construction trades workers	0.064	0.151	0.672
Electrical trades workers	-0.251	0.184	0.172
Food trades workers	0.125	0.229	0.586

Parameter	Estimate	Standard error	Pr > ChiSq
Hairdressers	-0.144	0.289	0.619
Year 11*			
Automotive and engineering trades workers	-0.128	0.192	0.504
Construction trades workers	0.084	0.179	0.638
Electrical trades workers	0.305	0.258	0.237
Food trades workers	-0.334	0.319	0.295
Hairdressers	0.183	0.332	0.580

Criterion	Intercept only	Intercept and covariates
AIC	18660.89	17594.34
SC	18666.62	17863.24
-2 Log L	18658.89	17500.34
N	2256	

The results of this exercise do not really help a great deal. 'Relevant' pre-apprenticeships increase the likelihood of completion relative to no pre-apprenticeship. However, a 'non-relevant' pre-apprenticeship reduces the likelihood of completion relative to no pre-apprenticeship by almost the same extent. It could be that 'non-relevant' pre-apprenticeships serve a useful function by acting as tasters. Having dismissed a particular trade as not suitable for them, students may go on to be more successful in their second choice. However, what makes us even more suspicious is that a number of the coefficients indicate that a 'non-relevant' pre-apprenticeship improves completion rates relative to a 'relevant' pre-apprenticeship in a number of trades (construction, food and hairdressing). We cannot suggest a plausible explanation as to why non-relevant pre-apprenticeship courses should be more effective at improving completion rates than relevant pre-apprenticeships. Moreover, there is no further information in the existing dataset by which we could tease out whether respondents in answering the question are commenting on the subject matter of the pre-apprenticeship and how it relates to the apprenticeship, or whether they are commenting on the quality of the pre-apprenticeship. Thus we are inclined to dismiss the results and stick to the simpler pre-apprenticeship/no pre-apprenticeship model.

So that the results from this model (which were presented in table 5) are easier to interpret, we take the coefficients to calculate the change in likelihood of completion associated with completing a pre-apprenticeship. The probabilities, in table 7, quantify what was apparent from the coefficients: that the effect of pre-apprenticeships depends on the occupation of the apprenticeship. Pre-apprenticeships appear to be working well in the construction trades and the food trades. There is evidence to suggest that they are having a perverse impact in the hairdressing and automotive and engineering trades. Namely, apprentices who have completed pre-apprenticeship programs are less likely to complete their training.

Clearly, undertaking a pre-apprenticeship is of no benefit for people who already hold a certificate III or higher qualification and indeed this reduces the likelihood of completing an apprenticeship. Beyond that, any clear effect for level of education is hard to discern. We would expect that pre-apprenticeships would be of most benefit to those with lower levels of education. This is not what the results indicate. Instead, a pre-apprenticeship increases the likelihood of completing an apprenticeship for those with Year 10 and those with Year 12, but not those with Year 11.[6]

[6] It may be that there are unobserved differences between students who leave school at Year 11 and students who leave school at Year 10 or Year 12 and that this affects the impact of pre-apprenticeships. However, we cannot offer a convincing explanation with the current dataset of what these differences may be.

Table 7 Probability of completing an apprenticeship by occupation and whether undertaken a pre-apprenticeship (%)

	Pre-apprenticeship	No pre-apprenticeship	Difference
Occupation			
Automotive and engineering	72.3	73.3	-0.9
Construction	85.2	81.1	4.1
Electro-technology	78.1	76.8	1.3
Food	56.4	52.5	4.0
Hairdressing	64.7	69.4	-4.6
All other trades and technical occupations	75.5	72.6	2.8
Highest level of education			
Cert. III	75.9	78.5	-2.7
Year 12	83.6	79.8	3.7
Year 11	68.7	69.5	-0.8
Year 10	72.8	68.8	4.0

Notes: Assumes apprentice is full-time, not an existing worker and commences at age 19.

Reasons for non-completion

The aim of this paper is to investigate how a pre-apprenticeship affects the apprenticeship experience. As well as the impact on satisfaction and the probability of completion we investigate whether undertaking a pre-apprenticeship affects reasons for non-completion. The Apprentice and Trainee Destination Survey asks respondents who did not complete their training the main reason for their non-completion. We divide the reasons for non-completion into three categories:

- ✧ didn't like the type of work or the type of training
- ✧ workplace reasons, such as didn't get on with the boss or the pay was too low
- ✧ other reasons, including personal reasons, being made redundant, or the apprenticeship was discontinued or cancelled.

We are most interested in the first category of reasons. We hypothesise that apprentices who have completed a pre-apprenticeship program should be more familiar with the type of work or training involved. We expect that apprentices who have undertaken a pre-apprenticeship program will be more likely to nominate workplace reasons or reasons from the 'other' grouping. These two categories are combined and used as the reference category because these reasons are mostly beyond the control of the apprentice and should be least likely to be influenced by pre-apprenticeships. Our hypothesis implies that we expect the pre-apprenticeship variable to be negatively related to the 'didn't like type of work or training' category.

We conduct a binary logistic regression, beginning once more with a full model, including interaction terms between the pre-apprenticeship variable, highest education level and occupation. All of the interaction terms are significant at the 0.001 level and the full unrestricted model is retained (see appendix E). The results are shown in table 8.

Once again, the effect of pre-apprenticeships on reasons for non-completion depends on the occupation of the apprenticeship and the apprentice's highest level of education. So that the results are more easily interpretable, the probabilities for the main categories of interest (pre-apprenticeship, occupation and highest level of education) are shown in table 9.

Table 8 Logistic regression of 'Main reason for not completing training is because apprentice didn't like the type of work or training'

Parameter	Estimate	Standard error	Pr > ChiSq
Undertook a pre-apprenticeship	-0.173	0.230	0.452
Pre-apprenticeship*			
Cert. III or higher	-0.937	0.556	0.092
Year 12	0.121	0.346	0.726
Year 11	0.523	0.338	0.122
Automotive and engineering trades workers	-0.389	0.362	0.283
Construction trades workers	0.189	0.369	0.609
Electrical trades workers	0.208	0.467	0.657
Food trades workers	-0.218	0.420	0.605
Hairdressers	-0.182	0.523	0.728
Intercept	3.501	1.275	0.006
Female	-0.238	0.165	0.149
Age at commencements	-0.285	0.067	<.0001
Age at commencement ^2	0.004	0.001	<.0001
Part-time worker	-0.314	0.310	0.310
Existing worker	-0.491	0.320	0.125
Duration/100	-0.041	0.032	0.192
Highest level of education			
Cert. III or higher	0.627	0.264	0.018
Year 12	-0.216	0.186	0.247
Year 11	-0.157	0.197	0.427
Year 10	NA	NA	NA
Occupation			
Automotive and engineering trades workers	-0.027	0.227	0.906
Construction trades workers	-0.780	0.282	0.006
Electrical trades workers	0.461	0.266	0.083
Food trades workers	0.186	0.242	0.443
Hairdressers	0.140	0.451	0.756
All other trades and technical occupations	NA	NA	NA
Cert. III or higher*			
Automotive and engineering trades workers	0.306	0.452	0.498
Construction trades workers	-0.715	0.728	0.327
Electrical trades workers	0.416	0.441	0.346
Food trades workers	0.280	0.436	0.522
Hairdressers	0.042	0.737	0.955
Year 12			
Automotive and engineering trades workers	0.028	0.292	0.923
Construction trades workers	-0.271	0.392	0.490
Electrical trades workers	-0.550	0.326	0.091
Food trades workers	0.517	0.317	0.102
Hairdressers	0.107	0.536	0.842
Year 11			
Automotive and engineering trades workers	-0.207	0.305	0.496
Construction trades workers	0.425	0.361	0.239
Electrical trades workers	-0.116	0.398	0.770
Food trades workers	-0.732	0.409	0.073
Hairdressers	0.511	0.436	0.240

Model fit statistics

Criterion	Intercept only	Intercept and covariates
AIC	5008.95	4804.47
SC	5013.99	5001.25
-2 Log L	5006.95	4726.47
N		1148

Table 9 Likelihood of choosing a work or training-related reason as main reason for not completing an apprenticeship (%)

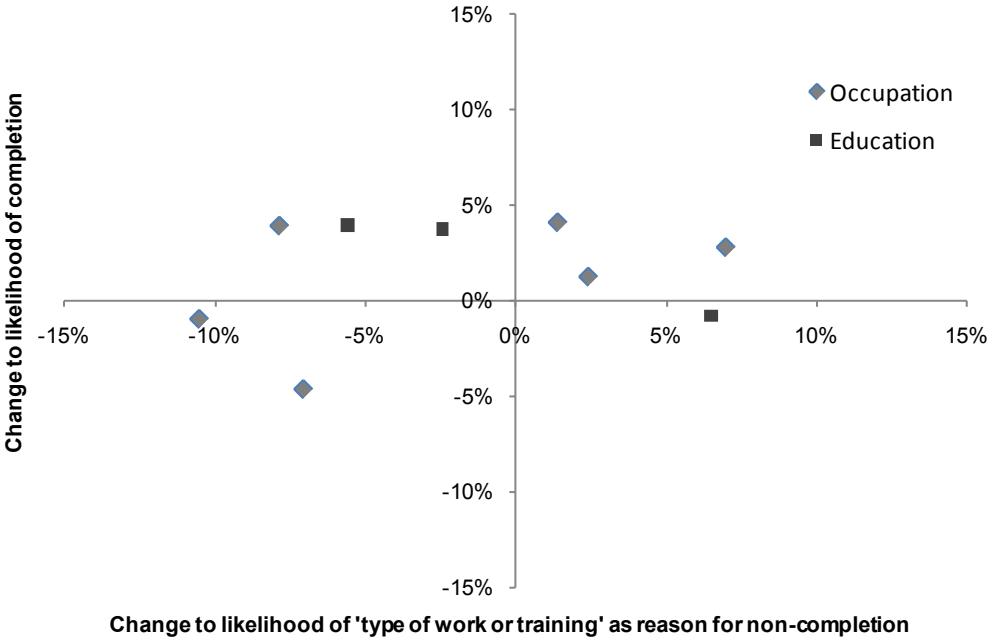
	Pre-apprenticeship	No pre-apprenticeship	Difference
Occupation			
Automotive and engineering	25.5	36.1	-10.5
Construction	23.8	22.4	1.4
Electro-technology	46.1	43.7	2.4
Food	36.6	44.5	-7.9
Hairdressing	38.1	45.2	-7.1
All other trades and technical occupations	49.9	42.9	7.0
Highest level of education			
Cert. III	24.7	51.7	-27.0
Year 12	26.0	28.4	-2.4
Year 11	40.2	33.7	6.5
Year 10	32.8	38.4	-5.6

Notes: Assumes apprentices is full-time, not an existing worker and commences at age 19.

Thus we find that pre-apprenticeships do have an effect on reasons for not completing. However, the effect is not uniform. So our tentative conclusion is that pre-apprenticeships do provide a better understanding of what work and training apprentices can expect in undertaking an apprenticeship. However, when we compare these effects with the earlier results relating to the probability of completion, we find little evidence that this better understanding translates into higher completion rates. This point is illustrated by figure 1.

In this figure, we plot for each occupation and prior education level the change to the likelihood of completion against the change to the likelihood of giving 'type of work or training' as the reason for non-completion. If improving an apprentice's understanding of the type of work or training that is involved in an apprenticeship is important to increasing completion rates, we would expect to see most data points in the upper left quadrant. That is, apprentices who complete a pre-apprentice program should be less likely to be dissatisfied with the type of work or training and therefore more likely to complete their training. Instead we see no consistent pattern at all. This suggests obtaining a better understanding of what the work involves does not contribute in any systematic way to improving completion rates.

Figure 1 Impact of pre-apprenticeships on reason for non-completion and likelihood of completion of an apprenticeship



Source: Tables 7 and 9.

Final comments

All in all, our analysis of the impact of pre-apprenticeships on various aspects of apprenticeships is not comforting for those who advocate the benefits of pre-apprenticeships.

On a positive note, we find that pre-apprenticeships lead to a modest increase in satisfaction with the job-related aspects of apprenticeships (but not the off-the-job training aspects). We also find that pre-apprenticeships appear to influence completion rates (and the reason for non-completion for those who do not complete). However, the effects vary across occupation and prior education and are not always in the direction expected. Thus we find a positive effect on the completion rates for construction and food, but a negative effect for hairdressing and automotive and engineering. In relation to education, those who already have a certificate III or higher qualification are less likely to complete if they do a pre-apprenticeship. If we take these results at face value, they point to the potential of pre-apprenticeships to act as a positive filter by providing prior knowledge and relevant experience, but suggest they also have the potential for negative effects. The difference between a positive and negative pre-apprenticeship experience probably has as much to do with the curriculum for pre-apprenticeships as how the structure and content of apprenticeships recognise prior learning in pre-apprenticeships—factors which are beyond the scope of this report. It seems that the design of effective pre-apprenticeships—and matching to the right candidate—is a challenge.

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Appendix A: Apprentice and Trainee Destination Survey

The Apprentice and Trainee Destination Survey provides information about the destinations of apprentices and trainees approximately nine months after they leave their training. The findings relate to apprentices and trainees who completed their training (completers) between April and June 2009, or who cancelled or withdrew from an apprenticeship or traineeship and did not return to finish (non-completers) during this period. The limited window may mean that we miss out on some groups of apprentices and trainees. For example, those who left their training to return to school would be unlikely to be in the survey.

The statistical publication from the survey (NCVER 2010a) presents employment outcomes, reasons for non-completion, satisfaction with the apprenticeship or traineeship, and further study destinations. A number of supporting documents are also available, including additional data tables and technical notes: <http://www.ncver.edu.au/publications/2262.html>.

As the survey is based on a sample and not the entire population of apprentices and trainees who stopped their training, estimates produced by the survey are subject to sampling and non-sampling error. Sampling error is a measure of the variability that occurs because a sample rather than the entire population responds to a survey. Non-sampling error may occur for reasons such as non-response bias, incorrect responses, interviewer errors, attrition, and processing errors (see NCVER 2010b). Non-response is typically not random, and often there is a tendency for the more successful to respond. To a large extent, this bias is addressed through the use of multivariate models, and we are confident that the relationships we have estimated between pre-apprenticeships and outcomes are reasonably robust.

Appendix B:

Table B1 Individual and employment characteristics of apprentices and trainees, by whether completed a pre-vocational or pre-apprenticeship course

	Did undertake a pre-apprenticeship			No pre-apprenticeship
	Relevant to apprenticeship	Not relevant to apprenticeship	Total	
Female	*26.4*	*3.6*	30.0	69.9
Male	*22.2*	*5.1*	27.3	72.7
Age at commencement				
19 years and under	*25.2*	*5.1*	30.3	69.7
20–24 years	*22.2*	*4.8*	27.1	72.9
25 years and over	*15.1*	*4.4*	19.4	80.6
Previous level of education				
Cert. III or higher	*17.9*	*8.5*	26.4	73.6
Year 12	*22.6*	*3.7*	26.3	73.7
Year 11	*27.0*	*7.2*	34.2	65.8
Year 10 or below	*22.2*	*4.1*	26.3	73.7
Non-English speaking	*28.0*	*4.6*	32.6	67.4
English speaking	*22.2*	*4.9*	27.2	72.8
Indigenous	**	**	29.5	70.5
Non-Indigenous	*22.4*	*5.0*	27.3	72.7
Have a disability	**	**	32.8	67.2
Do not have a disability	*22.7*	*4.8*	27.6	72.4
Metropolitan	*25.1*	*5.2*	30.2	69.8
Rural	*20.0*	*4.6*	24.5	75.5
Existing worker	*18.4*	*7.3*	25.7	74.3
Newly commencing worker	*23.2*	*4.6*	27.8	72.2
Private sector	*22.4*	*5.0*	27.4	72.6
Group training scheme	*24.5*	*4.8*	29.2	70.8
Public sector	**	**	25.9	74.1

Notes: ** Cannot be displayed because of low cell counts.

Table B2 Selected outcomes of apprentices and trainees, by whether completed a pre-apprenticeship

	Pre-apprenticeship	No pre-apprenticeship
	%	%
Overall satisfaction with apprenticeship		
Very satisfied	33.0	33.0
Satisfied	40.5	40.2
Neither satisfied nor dissatisfied	14.9	14.2
Dissatisfied	7.4	7.3
Very dissatisfied	4.1	5.3
Completer	64.9	62.9
Non-completer	35.1	37.1
Main reason for not completing:		
Related to type of work or training	*19.1*	*18.7*
Related to workplace	*33.8*	*35.8*
Other (inc. redundancy, personal reasons)	*47.1*	*45.5*
Employment status after training (completers only)		
Employed	88.4	91.7
Employed in same occupation	*76.7*	*77.7*
*Employed in different occupation***	*11.7*	*14.0*
Not employed	11.6	8.3
Employment status after training (non-completers only)		
Employed	71.5	72.4
Employed in same industry	*24.7*	*29.6*
Employed in different industry	*46.9*	*42.8*
Not employed	28.5	27.6

Notes: ** includes occupation not stated.

Appendix C

Factor analysis—satisfaction

The questionnaire includes items relating to satisfaction with the employment- and training- related aspects of the apprenticeship or traineeship. Exploratory factor analysis was used to determine whether separate employment and training or a combined satisfaction scale could be constructed.

A total of 16 variables were used in the factor analysis: nine employment-related items, six off-the-job training-related items and one overall satisfaction item. A tenth employment-related item was dropped because it was only asked of apprentices and trainees who were employed by a group training company.

Common factor analysis was used, rather than principal components analysis, since the observed variables are only indicators of the latent satisfaction constructs to be measured. Two factors were selected on the basis of Eigenvalues being greater than 1 (table B2). Orthogonal rotation using the VARIMAX method produced the final factor matrix shown in table C3.

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Table C1 Correlation matrix—satisfaction with apprenticeship

Correlations																
	Q10_01	**Q10_02**	**Q10_03**	**Q10_04**	**Q10_05**	**Q10_06**	**Q10_07**	**Q10_08**	**Q10_10**	**Q9_01**	**Q9_02**	**Q9_03**	**Q9_04**	**Q9_05**	**Q9_06**	**Q16**
Q10_01	1.000	0.525	0.350	0.432	0.525	0.440	0.560	0.638	0.629	0.235	0.286	0.257	0.257	0.186	0.284	0.507
Q10_02	0.525	1.000	0.409	0.500	0.622	0.533	0.606	0.509	0.660	0.251	0.250	0.218	0.231	0.189	0.261	0.500
Q10_03	0.350	0.409	1.000	0.385	0.360	0.302	0.365	0.313	0.432	0.167	0.171	0.153	0.179	0.141	0.172	0.359
Q10_04	0.432	0.500	0.385	1.000	0.425	0.385	0.424	0.385	0.504	0.259	0.254	0.223	0.223	0.173	0.235	0.385
Q10_05	0.525	0.622	0.360	0.425	1.000	0.496	0.673	0.574	0.647	0.272	0.270	0.257	0.221	0.212	0.279	0.505
Q10_06	0.440	0.533	0.302	0.385	0.496	1.000	0.512	0.481	0.584	0.218	0.225	0.204	0.211	0.149	0.240	0.428
Q10_07	0.560	0.606	0.365	0.424	0.673	0.512	1.000	0.667	0.716	0.291	0.242	0.233	0.226	0.209	0.293	0.545
Q10_08	0.638	0.509	0.313	0.385	0.574	0.481	0.667	1.000	0.660	0.245	0.276	0.282	0.271	0.222	0.311	0.523
Q10_10	0.629	0.660	0.432	0.504	0.647	0.584	0.716	0.660	1.000	0.281	0.296	0.255	0.270	0.205	0.320	0.631
Q9_01	0.235	0.251	0.167	0.259	0.272	0.218	0.291	0.245	0.281	1.000	0.436	0.490	0.494	0.466	0.549	0.318
Q9_02	0.286	0.250	0.171	0.254	0.270	0.225	0.242	0.276	0.296	0.436	1.000	0.481	0.596	0.459	0.541	0.335
Q9_03	0.257	0.218	0.153	0.223	0.257	0.204	0.233	0.282	0.255	0.490	0.481	1.000	0.546	0.482	0.581	0.317
Q9_04	0.257	0.231	0.179	0.223	0.221	0.211	0.226	0.271	0.270	0.494	0.596	0.546	1.000	0.465	0.593	0.321
Q9_05	0.186	0.189	0.141	0.173	0.212	0.149	0.209	0.222	0.205	0.466	0.459	0.482	0.465	1.000	0.594	0.251
Q9_06	0.284	0.261	0.172	0.235	0.279	0.240	0.293	0.311	0.320	0.549	0.541	0.581	0.593	0.594	1.000	0.346
Q16	0.507	0.500	0.359	0.385	0.505	0.428	0.545	0.523	0.631	0.318	0.335	0.317	0.321	0.251	0.346	1.000

Eigenvalues of the reduced correlation matrix: Total = 8.314 Average = 0.520

Table C2 Reduced correlation matrix—satisfaction with apprenticeship

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	6.299	4.283	0.758	0.758
2	2.016	1.780	0.243	1.000
3	0.235	0.065	0.028	1.028
4	0.170	0.097	0.021	1.049
5	0.073	0.020	0.009	1.058
6	0.053	0.021	0.006	1.064
7	0.033	0.010	0.004	1.068
8	0.022	0.031	0.003	1.071
9	-0.009	0.031	-0.001	1.070
10	-0.040	0.005	-0.005	1.065
11	-0.046	0.007	-0.006	1.059
12	-0.053	0.019	-0.006	1.053
13	-0.072	0.020	-0.009	1.044
14	-0.092	0.039	-0.011	1.033
15	-0.131	0.014	-0.016	1.017
16	-0.145		-0.017	1

Figure C1 Scree plot of Eigenvalues

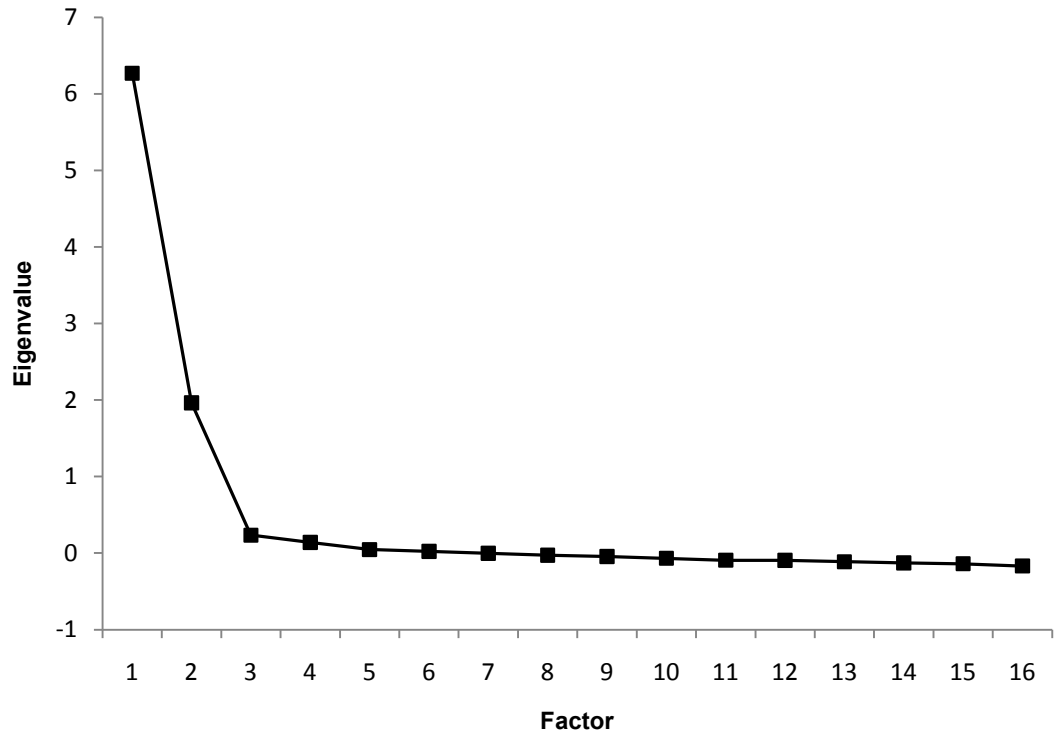

Table C3 Rotated factor pattern—satisfaction with apprenticeship

Apprentice satisfaction with …	Factor 1 Job-related aspects	Factor 2 Training-related aspects
The type of work you were/are doing	0.697	0.187
The working conditions	0.751	0.144
The pay	0.477	0.117
The hours of work	0.554	0.184
Receiving adequate supervision	0.746	0.169
Relationships with co-workers	0.632	0.138
Training provided by your employer	0.798	0.154
The skills you learnt on the job	0.726	0.202
Your employment overall	0.861	0.174
Frequency of training	0.205	0.636
Relevance of the skills to your workplace	0.207	0.666
The fairness of the assessments of your skills and knowledge	0.170	0.696
The relevance of the assessment tasks	0.162	0.737
The quality of the training facilities and equipment	0.112	0.669
Overall quality of the off-the-job training	0.198	0.788
Overall satisfaction with apprenticeship/traineeships	0.634	0.291

Our initial unrestricted models for satisfaction include three interaction effects: occupation by highest education level, pre-apprenticeship by highest education level, and pre-apprenticeship by occupation. Including more parameters necessarily reduces the error in the model. The F-test is the appropriate test of whether the reduction in error is large enough that it can be attributed to the effect of the additional parameters, and not due to random noise in the sample.

The F-statistic for restricted model M is measured by

$$F = \frac{(\frac{RSS_M - RSS_F}{p_F - p_M})}{(\frac{RSS_F}{n - p_F})}$$

Where RSS_M is the residual sums of squares for the restricted model M, RSS_F is the residual sums of squares for the full model F, p_F is the number of parameters in the full model F, p_M is the number of parameters in the restricted model M and n is the number of observations.

The null hypothesis assumes that the full unrestricted model F does not provide a significantly better fit than the restricted model M. The distribution of the F-score will have ($p_F - p_M$, $n - p_F$) degrees of freedom.

Table C4 F-test statistics for comparing unrestricted and restricted models of satisfaction

	N	No of par	Residual sum squares	F score	df1	df2	Sig value
Satisfaction with job							
A Expanded model with all interaction	1610	39	7706.273				
B Restricted model with no OCC|HEL interaction	1610	24	7751.234	0.611	15	1595	0.8681
C Restricted model with no PRE|OCC interaction	1610	34	7728.441	0.904	5	1605	0.4776
D Restricted model with no PRE|HEL interaction	1610	36	7717.99	0.796	3	1607	0.4959
E Restricted model with no interactions	1610	16	7785.983	0.707	23	1587	0.8433
Satisfaction with off-the-job training							
A Expanded model with all interaction	1610	39	7881.153				
B Restricted model with no OCC|HEL interaction	1610	24	7968.455	1.160	15	1595	0.2967
C Restricted model with no PRE|OCC interaction	1610	34	7913.635	1.295	5	1605	0.2633
D Restricted model with no PRE|HEL interaction	1610	36	7892.319	0.742	3	1607	0.5271
E Restricted model with no interactions	1610	16	8004.744	1.071	23	1587	0.3708

For all interaction effects in both models, we accept the null hypothesis and assume that the restricted model with no interaction effects provides the best fit to the data. We therefore present the coefficients from the restricted model.

Appendix D

Likelihood of completing an apprenticeship or traineeship

To model the likelihood of completing training, we combine the completer and non-completer sub-samples. We weight these data, using information from the same administrative data from which the sample was drawn. The data have been weighted by state, completion status (completer/non-completers) and occupation (trade/non-trade). We run a logistic regression where the dependent variable is whether or not the apprenticeship was completed, using the proc survey logistic procedure in SAS to take account of the survey strata.

We tested numerous possible interaction effects. We began with the unrestricted model, including three interaction effects: occupation by highest education level, pre-apprenticeship by highest education level, and pre-apprenticeship by occupation. We then ran three restricted models, removing one interaction block in each model. Removing parameters necessarily results in an increase in -2 log likelihood scores. The deviance statistic tests if the increase in log likelihood is too large and the assumption of a simplified model is not justified.

The deviance statistic for model M is measured by:

$$D(M) = (-2\ln l_F - -2\ln l_M)$$

Where l_F is the likelihood of the full model and l_M is the likelihood of the restricted model M. The deviance statistic has an approximate Chi-Square distribution, with p_F-p_M degrees of freedom, where p_F is the number of parameters in the full model and p_M is the number of parameters in the restricted model M.

When we tested the interaction blocks, we found that the full model with all interaction terms results in the best fit.

Table D1 Summary of deviance tests for interaction effects—logistic regression of likelihood of completing an apprenticeship or traineeship

Model	-2 Log likelihood	Deviance tests				
		Models compared	Statistic	df	Sig value	Decision
A Full model, all interactions	17589.025					
B No OCC*HEL	17731.323	B to A	142.298	15	0.000	Reject H0, Model A a better fit
C No PRE*HEL	17600.278	C to A	11.253	3	0.010	Reject H0, Model A a better fit
D No PRE*OCC	17603.203	D to A	14.178	5	0.015	Reject H0, Model A a better fit

When the binary pre-apprenticeship independent variable is replaced with a categorical variable, indicating whether the respondent undertook a relevant pre-apprenticeship, a pre-apprenticeship that was not relevant, or did not undertake any pre-apprenticeship, the interaction between occupation and highest education level is again significant but the other two interaction terms are not.

Table D2 Summary of deviance tests for interaction effects—logistic regression of likelihood of completing an apprenticeship or traineeship (categorical pre-apprenticeship variable)

Model	-2 Log likelihood	Deviance tests				
		Models compared	Statistic	df	Sig value	Decision
A Full model, all interactions	17500.335					
B No OCC*HEL	17639.593	B to A	139.258	15	0.00000	Reject H0, Model A a better fit
C No PRE*HEL	17514.972	C to A	14.637	6	0.02328	Reject H0, Model A a better fit
D No PRE*OCC	17569.125	D to A	68.790	10	0.00000	Reject H0, Model A a better fit

Appendix E

Reason for not completing an apprenticeship or traineeship

Table E1 Summary of deviance tests for interaction effects—main reason for not completing apprenticeship or traineeship

Model	-2 Log likelihood	Deviance tests				
		Models compared	Statistic	df	Sig value	Decision
A Unrestricted model, all interactions	4726.469					
B No OCC*HEL	4798.195	B to A	143.452	15	0.000	Reject H0, Model A a better fit
C No PRE*HEL	4746.462	C to A	39.986	3	0.000	Reject H0, Model A a better fit
D No PRE*OCC	4738.815	D to A	24.692	5	0.002	Reject H0, Model A a better fit

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